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10/633,014	08/01/2003	Yushi Kaneda	NP-0079	4735

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EXAMINER	
VAN ROY, TOD THOMAS	
ART UNIT	**PAPER NUMBER**
2828	

DATE MAILED: 09/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	**Application No.** 10/633,014	**Applicant(s)** KANEDA ET AL.	
	Examiner Tod T. Van Roy	**Art Unit** 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6-15,20-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-15,20-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's *amendments*, see pages 3-6, filed 07/05/2005, with respect to the rejection(s) of claim(s) 1-7 and 9-19, and 21-22 under 35 USC 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art.

Response to Arguments

Applicant's *arguments*, see pages 3-6, filed 07/05/2005, with respect to the rejection(s) of claim(s) 20 under 35 USC 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-4, and 7-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. (US 6816514) in view of Cai et al. (Haiwen Cai; Xia Jiangzhen; Hao Zhao; Chen Gaoting; Fang Zujie; Kim, I.S.; Yohee Kim; Optical Fiber Communication Conference and Exhibit, 2002. OFC 2002 17-22 Mar 2002 Page(s): 654 - 655).

With respect to claim 1, Jiang teaches a polarization-dependent resonant cavity (fig.8, col.10 lines 14-15, PM fiber including narrowband grating which would induce 2 polarization based reflection bands) including a fiber chain having a gain medium (fig.8 #156) between narrowband (fig.8 #162, col.10 line 14, wavelength selective, i.e. narrow band) and broadband fiber gratings (fig.8 #160, col.10 lines 16-17, taught to function as broadband reflector), at least one of said fiber gratings or gain medium not formed in a non-polarization maintaining fiber (PM fiber only contains grating #162, col.10 lines 14-15), a pump source that couples energy into the fiber chain to pump the gain medium (col.10 line 10). Jiang does not teach a modulator for q-switching the laser. Cai teaches a modulator that applies stress to a non-PM portion of a fiber chain (fig.4, col.2 para.2, PZT taught to be located near to the high reflectance grating outside of active fiber loop), which would induce birefringence, and switch the cavity Q-factor to alternately

store energy in the gain medium and then release the energy in a laser pulse (col.1 para.2). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the polarization-dependent fiber laser cavity of Jiang with the modulator of Cai in order to alter the Q of the cavity allowing for the storage and release of energy pulses from the gain medium for use in a wide range of industrial applications such as time domain reflectometry and laser range finding (Cai, col.1 para.1).

With respect to claim 2, Jiang and Cai teach the laser outlined in the rejection to claim 1 and further teach a portion of the fiber chain to comprise a polarization-dependent fiber (Jiang, col.10 lines 14-15).

With respect to claim 3, Jiang and Cai teach the laser outlined in the rejection to claim 1 and further teach the narrowband fiber grating to be formed in a polarization maintaining (PM) fiber (col.10 lines 14-15) creating a pair of reflection bands that correspond to different polarization modes (inherent outcome of narrowband grating in a PM fiber), and the broadband grating is formed in the non-PM fiber having a reflection band that is aligned to one of the narrowband grating's reflection bands (this would in turn be inherent, as Jiang's fiber laser would not function without the alignment of at least one of the reflection bands to provide feedback).

With respect to claim 4, Jiang and Cai teach the laser outlined in the rejection to claim 1, and Cai further teaches the modulator to comprise a piezoelectric transducer (PZT) (fig.4). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the Q-switched laser of Jiang and Cai with the PZT of Cai, as PZT's are well known and inexpensive fiber modulation component.

With respect to claim 7, Jiang and Cai teach the laser outlined in the rejection to claim 1 and further teach the gain medium to be formed in an oxide-based multi-component glass fiber (Jiang, col.10 lines 11-12) and the gratings to be located in separate fibers attached at either end of the multi-component fiber (doped core #156 shown to be between each grating, noting PM designated fiber span) but do not teach the gratings to be formed in passive silica fiber. Silica fibers are very well known in the art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to locate the gratings in passive silica fibers, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960).

With respect to claim 8, Jiang and Cai teach the laser outlined in the rejection to claim 1 including the laser pulse to be single frequency (Jiang, col.10 lines 41-42) and the length of the resonator to be less than 5 cm (Jiang, col.10 lines 40-42, fig.10, noting grating length would not constitute enough length to exceed 5cm even using the longest gain section span of 2.5cm).

With respect to claim 9, Jiang and Cai teach the laser outlined in the rejection to claim 1 but do not teach the full-width half-maximum of the laser pulse to be less than 100 ns, the repetition rate of the laser pulse to be at least 1kHz, or the peak power to be at least 1W. The operational characteristics of the laser are a matter of design choice and intended usage, thus it would have been obvious to one of ordinary skill in the art at

the time of the invention to operate the laser device of Jiang and Cai at suitable levels to fit a desired application.

With respect to claim 10, Jiang and Cai teach the laser outlined in the rejection to claim 1, and Cai further teaches the modulator to apply stress to a non-PM portion of fiber, which does not include the gain medium. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser of claim 1 with the modulator placement of Cai as it would be counter productive to stress a PM fiber section, as this type of fiber is meant to stabilize the optical signal, and would accordingly be unwise to induce material changing stresses into the gain media as this would detrimentally affect the stimulation/amplification process.

With respect to claim 11, Jiang and Cai teach the laser outlined in the rejection to claim 1 including using only a contiguous section of PM fiber (Jiang, col.10 lines 14-15, only 1 section used)

With respect to claim 12, Jiang teaches a polarization-dependent resonant cavity (fig.8, col.10 lines 14-15, PM fiber including narrowband grating which would induce 2 polarization based reflection bands) including a gain fiber (fig.8 #156), a narrowband grating formed in a PM fiber spliced to one end of the gain fiber (col.10 lines 14-15), said narrowband grating in said PM fiber having two reflection bands that correspond to different polarization modes (inherent to narrow band grating in PM fiber), and a broadband grating formed in a non-PM fiber spliced to the other end of the gain fiber (doped core #156 shown to be between each grating, noting grating #160 outside this region), said broadband grating having a reflection band that is aligned to one of the

narrowband grating's reflection bands (this would in turn be inherent, as Jiang's fiber laser would not function without the alignment of at least one of the reflection bands to provide feedback), a pump source that couples energy into the resonant cavity to pump the gain fiber (col.10 line 10). Jiang does not teach a modulator for q-switching the laser. Cai teaches a modulator that applies stress to a non-PM portion of a fiber chain (fig.4, col.2 para.2, PZT taught to be located near to the high reflectance grating outside of active fiber loop), which would induce birefringence, and switch the cavity Q-factor to alternately store energy in the gain medium and then release the energy in a laser pulse (col.1 para.2). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the polarization-dependent fiber laser cavity of Jiang with the modulator of Cai in order to alter the Q of the cavity allowing for the storage and release of energy pulses from the gain medium for use in a wide range of industrial applications such as time domain reflectometry and laser range finding (Cai, col.1 para.1).

With respect to claim 13, Jiang and Cai teach the laser outlined in the rejection to claim 12 and further teach the resonant cavity to comprise only one section of PM fiber (Jiang, col.10 lines 14-15).

With respect to claim 14, Jiang and Cai teach the laser outlined in the rejection to claim 13, and further teach the one section of PM fiber to comprise the narrowband grating (Jiang, col.10 lines 14-15). Jiang and Cai do not teach the gain fiber to be of PM type. It would have been obvious to one of ordinary skill in the art at the time of the invention to further place the gain region in PM fiber in order to add an additional degree of polarization control to the system.

With respect to claim 15, Jiang and Cai teach the laser outlined in the rejection to claim 1 and further teach the gain medium to be formed in an oxide-based multi-component glass fiber (Jiang, col.10 lines 11-12) and the gratings to be located in separate fibers attached at either end of the multi-component fiber (doped core #156 shown to be between each grating, noting PM designated fiber span) but do not teach the gratings to be formed in passive silica fiber. Silica fibers are very well known in the art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to locate the gratings in passive silica fibers, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960).

With respect to claim 20, Jiang teaches a resonant cavity (fig.8) including a narrowband reflector (fig.8 #162, col.10 line 14, wavelength selective, i.e. narrow band) having a polarization-dependent reflection band centered at a laser wavelength (col.10 lines 21-22), a gain medium (fig.8 #156) and a broadband reflector (fig.8 #160, col.10 lines 16-17, taught to function as broadband reflector) having a reflection band that overlaps the polarization-dependent reflection band (inherent, as Jiang's fiber laser would not function without the alignment of at least one of the reflection bands to provide feedback) so that the cavity has a high Q-factor at the laser wavelength and polarization, a pump source that couples energy into the resonant cavity to pump the gain medium (fig.8 #156). Jiang does not teach a modulator for q-switching the laser. Cai teaches a modulator that applies stress to a non-PM portion of a fiber chain (fig.4,

col.2 para.2, PZT taught to be located near to the high reflectance grating outside of active fiber loop), which would induce birefringence, and switch the cavity Q-factor to alternately store energy in the gain medium and then release the energy in a laser pulse (col.1 para.2). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the polarization-dependent fiber laser cavity of Jiang with the modulator of Cai in order to alter the Q of the cavity allowing for the storage and release of energy pulses from the gain medium for use in a wide range of industrial applications such as time domain reflectometry and laser range finding (Cai, col.1 para.1).

With respect to claim 21, Jiang and Cai teach the laser outlined in the rejection to claim 20 and further teach the reflectors and gain medium to be formed in a fiber chain (Jiang, fig.8), and Cai further teaches the modulator to apply stress to a non-PM portion of fiber altering its birefringence. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser of claim 1 with the modulator placement of Cai as it would be counter productive to stress a PM fiber section, as this type of fiber is meant to stabilize the optical signal.

With respect to claim 22, Jiang and Cai teach the laser outlined in the rejection to claim 20, and further teach further teach the narrowband fiber grating to be formed in a polarization maintaining (PM) fiber (col.10 lines 14-15) creating a pair of reflection bands that correspond to different polarization modes (inherent outcome of narrowband grating in a PM fiber), and the broadband grating is formed in the non-PM fiber having a reflection band that is aligned to one of the narrowband grating's reflection bands (this

would in turn be inherent, as Jiang's fiber laser would not function without the alignment of at least one of the reflection bands to provide feedback).

With respect to claims 23, 24, and 26, Jiang teaches a polarization-dependent resonant cavity (fig.8, col.10 lines 14-15, PM fiber including narrowband grating which would induce 2 polarization based reflection bands) including a fiber chain having a gain medium (fig.8 #156) between a first fiber grating (fig.8 #162, col.10 line 14, wavelength selective, i.e. narrow band) and second fiber gratings (fig.8 #160, col.10 lines 16-17, taught to function as broadband reflector), at least one of said fiber gratings or gain medium not formed in a non-polarization maintaining fiber (PM fiber only contains grating #162, col.10 lines 14-15), a pump source that couples energy into the fiber chain to pump the gain medium (col.10 line 10). Jiang does not teach a modulator for q-switching the laser. Cai teaches a modulator that applies stress to a non-PM portion of a fiber chain (fig.4, col.2 para.2, PZT taught to be located near to the high reflectance grating outside of active fiber loop), which would induce birefringence, and switch the cavity Q-factor to alternately store energy in the gain medium and then release the energy in a laser pulse (col.1 para.2). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the polarization-dependent fiber laser cavity of Jiang with the modulator of Cai in order to alter the Q of the cavity allowing for the storage and release of energy pulses from the gain medium for use in a wide range of industrial applications such as time domain reflectometry and laser range finding (Cai, col.1 para.1).

With respect to claim 25, Jiang and Cai teach the laser outlined in the rejection to claim 23, and Jiang further teaches the fiber chain to include only one section of PM fiber including the first grating (col.10 lines 14-15).

With respect to claim 27, Jiang and Cai teach the laser outlined in the rejection to claim 23, and Cai further teaches the modulator to apply stress to a non-PM portion of fiber, which does not include the gain medium. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser of claim 23 with the modulator placement of Cai as it would be counter productive to stress a PM fiber section, as this type of fiber is meant to stabilize the optical signal, and would accordingly be unwise to induce material changing stresses into the gain media as this would detrimentally affect the stimulation/amplification process.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang in view of Cai, and further in view of Yao (US 6480637).

With respect to claim 6, Jiang and Cai teach the laser outlined in the rejection to claim 1, but do not teach the retardance of the birefringence to be one-quarter wave of the laser pulse. Yao teaches a PZT/fiber system which varies the retardance of the birefringence from 0 to 2pi (Yao, col.2 lines 62-65). It would have been obvious to one of ordinary skill in the art at the time of the invention to choose the retardance value to be one-quarter wave, as it is a matter of design choice as to which value is suitable for the intended purpose and is further described by MPEP 2144.07.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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